DUNNAIR
Established 1961

by

Smart Temp

Installer Manual

SMT-770 Chameleon Multifunction Thermostat

Ver 3.0

(Note: DAT-770 is mode reference used by Dunnair. SMT-770 and DAT-770 refer to same thermostat)

This document it not typically left with the user as it contains information on setting values which, if not correctly set may damage the heating, cooling or air conditioning system or seriously affect its performance or energy consumption.

Great effort has been taken to making the SMT-770 thermostat system intuitive, reliable and easy to install. Using a common sense approach to the installation will ensure this product is installed easily and to the customer's satisfaction. Please read and understand this instruction manual so that installation, testing and commissioning process is undertaken in an efficient and effective manner.

This manual is to be used in conjunction with the supplied user manual.

Great care has been taken in the preparation of this manual. Smart Temp Australia P/L takes no responsibility for errors or omissions contained in this document. It is the responsibility of the user to ensure this thermostat, or the equipment connected to it is operating to their respective specifications and in a safe manner.

Due to ongoing product improvement Smart Temp Australia P/L reserves the right to change the specifications of the SMT-770 thermostat (or its components) without notice.

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Installation

As with any air conditioning project undertaken, careful installation is the key to a successful outcome. Time taken during this installation process will be rewarded with a happy customer and fewer call-backs.

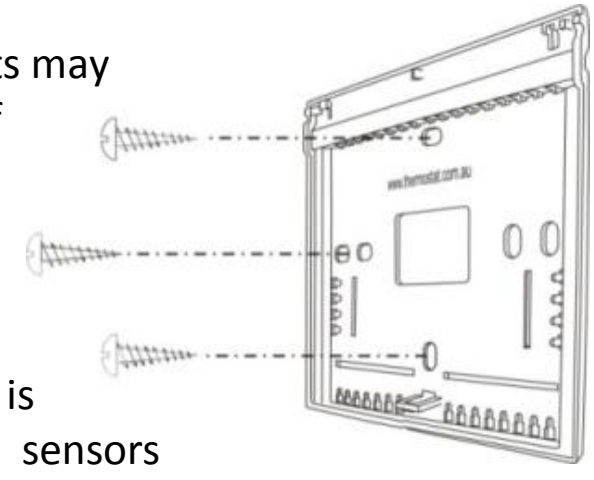
The steps required to install the SMT-770 thermostat are -

1. Read and understand this manual and the User manual.
2. Mount the SMT-770 back plate in a suitable location.
3. Set the 8 DIP switches to match the need of the project / user.
4. Wire the optional remote temperature sensor(s) or switches if required.
5. Power up the air conditioning system.
6. Set the installer software options (if required).
7. Program and set up the SMT-770 thermostat.
   (The User Manual will assist with this).
8. Test the heating, cooling and other functions – Commissioning.

For convenience the layout of this manual is in the same order as the steps listed above.

Mounting the SMT-770 thermostat.

The SMT-770 can only be as accurate as the onboard temperature sensor, or its optional remote temperature sensor(s) permit. It is therefore essential that the SMT-770 be installed in a location that is typical of the ambient room temperature. Do not install the thermostat in a draft, near a floor, behind doors or on a non-insulated external wall. Also avoid placing the thermostat in areas where the air movement is limited, affected by direct sunlight or other areas not “typical” of the temperature of the room.



Further, when mounting the SMT-770 is aware that drafts may travel down the inside of cavity walls, (especially if mounted on external walls) and enter the back of the thermostat or sensor enclosure through the cable entry holes in the wall. It is important to fully seal these holes to prevent any drafts affecting the internally mounted temperature sensor. It is recommended to mount the SMT-770 or remote sensors between 1.5 & 1.7 metres from the floor where possible.

Move the control wires through the large opening in the thermostat base plate then place the thermostat base on the wall and using appropriate screws, firmly attach the thermostat base to the wall. Block any holes where cables enter the back of the thermostat to prevent drafts entering through these holes affecting the sensor.

Setting the hardware switches

Switch	Off	On
Sw1 – Fan Speeds	1 Speed Fan	3 Speed Fan
Sw2 – Equipment Type	Heat Cool	Heat Pump (O/B terminals)
Sw3 – Stages	1 Stage	2 Stages
Sw4 – Reversing Valve If Sw 2= ON – Heat Pump	Energise in cool (O)	Energise in heat (B)
Sw4 – Fan Mode If Sw 2= OFF – Heat/cool	Fan Control by Heater (HG)	Fan Control by T'stat (HE)
Sw5 – Anti cycle timer	Off	4 Minutes
Sw6 – Operation	Manual Thermostat	Programmable Thermostat
Sw7 – Minimum Run	2 minutes	6 Minutes
Sw8 – Program Type If Sw 6= ON – Programmable	Commercial Program	Residential Program
Sw8 – Set points If Sw 6= OFF – Manual	Single Set point	Two Set points

Typical drawings have been provided on page 12 of this manual that will assist with the selection of the correct positions for these function switches.

Switch 1 – Relay Assignment

The SMT-770 is fitted with 5 relays capable of switching up to 24VAC @ 1Amp. Switch 1 sets the function of these relays as either 3 fan speeds with 1 heat and 1 cool operation or single fan speed with 2 heat and 2 cool, in either HP (heat pump / reverse cycle) or HC (heat with add on cool) mode.

Switch 2 – Equipment Type.

Both heat with add on cool or heat pump types of systems can be controlled by the SMT-770.

Heat Cool System uses the "W" terminal(s) only for heating and the "Y" terminal(s) only for cooling.

Heat Pump systems use the "Y" terminal(s) for **BOTH** heating and cooling (the compressor). The "W1" terminal to control the reversing valve which determines heating or cooling mode.

Switch 3 – Equipment Stages.

When it is necessary to control a single stage A/C system fitted with auxiliary heating elements, turn Sw3 OFF thereby selecting single stage mode. Heating elements controlled by the W2 output are now assigned as stage 2 heat.

Switch 4 – Reversing Valve or Fan Mode

When the SMT-770 is set for Heat Pump mode (Sw2 is on) then this switch sets the reversing valve logic (O/B). When the SMT-770 is set for Heat Cool mode (Sw2 is off) then this switch sets the mode for the Heater fan logic (HG or HE mode).

Switch 5 – Anti Cycle Timer

To protect some A/C systems it is preferred that under no circumstances should the compressor start within 4 minutes of it switching off.

Note: when power is first applied to the SMT-770 it "assumes" that the compressor has just stopped and applies this anti cycle delay time before starting.

Switch 6 – Thermostat Operation

To suit the varying requirements of the user, the SMT-770 can be set as a programmable thermostat using the time clock to automatically control the building temperature to a programmed temperature profile or to the very simple to operate manual mode where the user turns the thermostat on or off and adjusts the temperature set point manually.

Switch 7 – Minimum Run Time.

To conserve energy and protect the A/C system it is recommended to limit the number of times the heating and / or cooling system can run in 1 hour. This switch sets the minimum heating and cooling equipment to a minimum run time of 2 or 6 minutes. Once the heating or cooling has started it must run for this minimum set time. The LCD will flash the word "Heating" or "Cooling" whenever this timer is in effect.

Switch 8 – Thermostat Control Logic.

This switch also has two functions based on the position of switch 6. When the SMT-770 is set as a programmable thermostat, switch 8 determines whether a commercial program or residential program is selected. When switch 6 has the SMT-770 used as a non programmable thermostat, this switch sets single set point mode (imitating a simple mechanical thermostat) or whether a separate heating and cooling set point can be selected by the user. Two set point mode also permits the user to select a separate day and night set point if required.

TT Terminal Functions

The SMT-770 is fitted with a set of terminals marked “TT”. Details on the functions that the “TT” terminals perform is provided below. See the advanced installer setting menu on page 19 of this manual for setting the function of this set of terminals. The wiring used in the following examples are not polarity dependent and do not normally require screened cable.

Note: The SMT-770 can use multiple sensors if required for averaging. Drawings showing these various configurations are shown on page 37 of this manual.

Outside Air Sensor Wiring

Set "TT= OA" in the advanced installer menu.

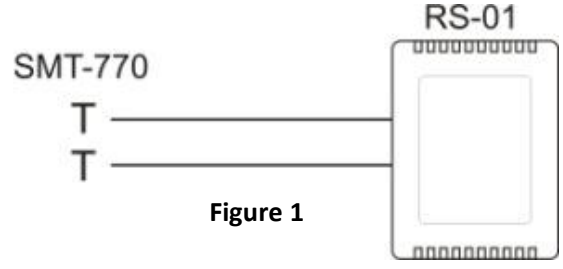


Figure 1

The SMT-770 can display the outside air temperature if desired. Some advanced control functions such as high and low balance points rely on this sensor to be fitted for correct operation. Using a single pair of wires connect the "TT" terminals in the SMT-770 to the two terminals in the outside air temperature sensor. *(See figure 1)*. If the outside air sensor fails two dashes will be shown on the LCD where the outside air temperature would normally be displayed to alert you of the problem.

Remote Air Temperature Sensor Wiring.

Set "TT= RS" in the advanced installer menu. (Default)

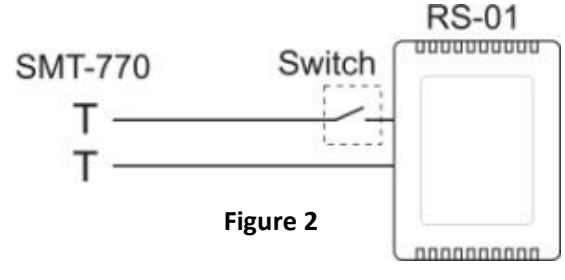


Figure 2

When you wish to measure the temperature from a location distant from the SMT-770, simply connect a remote temperature sensor to the "TT" terminals in the SMT-770. This will automatically disable the sensor fitted to the SMT-770 and use the remote temperature sensor(s) to control the room temperature (See figure 1 above). Should you wish, you can easily switch the remote temperature sensor on and off thereby switching temperature sensing locations between the remote temperature sensor and the SMT-770 temperature sensor when required. Simply fit an inline switch in the sensor wiring or order Smart Temp part number RS-01S sensor. *(See Figure 2.)*

Averaging Temperature Sensors

Set "TT= AV" in the advanced installer menu.

The SMT-770 can average the sensed temperature equally between the remote temperature sensor(s) and the one fitted to the SMT-770 if required. See figure 1 on the previous page for details on wiring the sensor. The SMT-770 will auto-detect this sensor and automatically average the two sensors values to control the room temperature.

Remote ON / OFF Function

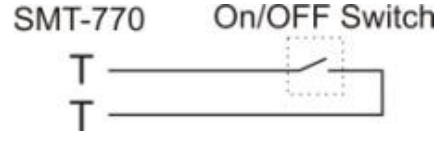


Figure 3

Set "TT= OF" in the advanced installer menu.

The SMT-770 can be connected to an external dry contact. When this contact is closed the SMT-770 will turn OFF. See figure 3. When the SMT-770 has been switched OFF via the "TT" terminals the word "OFF" will flash in the LCD to indicate that this has been the shutdown method. The SMT-770 will return to the user settings when this switch is open.

Using the "Occupancy Mode"

Set "TT= OC" in the advanced installer menu.

The SMT-770 can alternate between the user preferred set points and an installer pre programmed set point when required. Simply wire a remote switch to the SMT-770 "TT" terminals (see figure 3). When the switch is open the user settings will control the room temperature. When the switch is closed the Installer "Oc" (Occupied Cooling value) & "Oh" (Occupied Heating value) settings will be used to control the room temperature.

Supply Air Temperature Monitoring

Set "TT= DA" in the advanced installer menu.

In this mode, the SMT-770 will broadcast this sensor temperature value to ModBus ONLY, this value is not used by the SMT-770 nor is it displayed on the LCD. It is expected that this information is used for supervisory functions or equipment control feedback. Also, as this is an analogue input, by monitoring a switched resistor network your supervisory software can decode a number of digital states.

Typical Drawings

The SMT-770 has the capacity to control a wide selection of heating, cooling and air conditioning systems. Using the 8 DIP switches and many installer software options, the SMT-770 is capable of providing many different control methods from its 5 fitted relays. Examples of only the most common types of control wiring have been provided below.

You may need to modify these drawings slightly to specifically suit your individual needs, alternatively contact Smart Temp at support@smarttemp.com.au or an authorised distributor for installation information specific to your application.

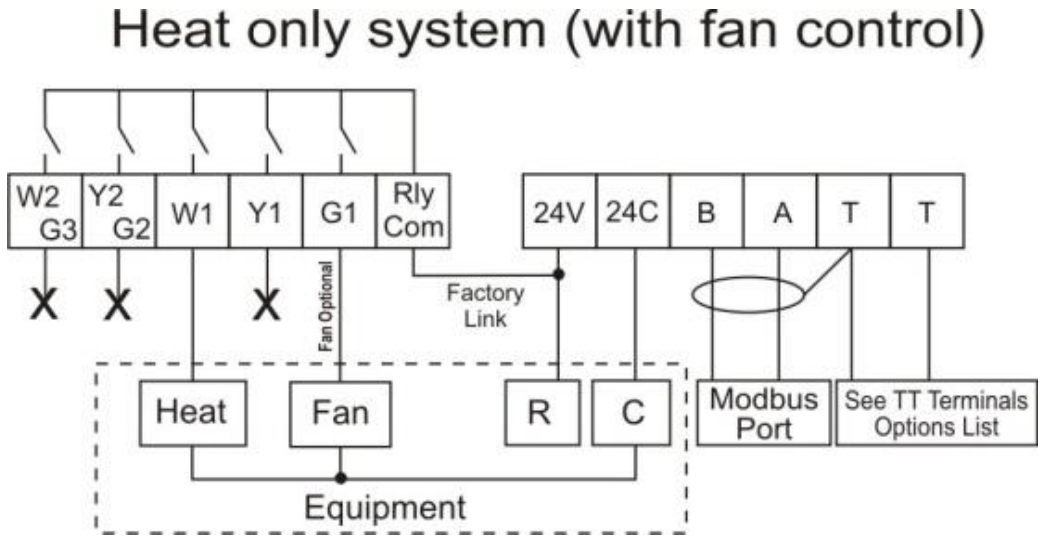


Figure 4

Switch Settings
Sw1 = Off (1 speed fan)
Sw2 =Off (HC System)
Sw3=Off (Single Stage)
Sw4= Off (HG)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements
Tip
Set Installer menu Fn=H

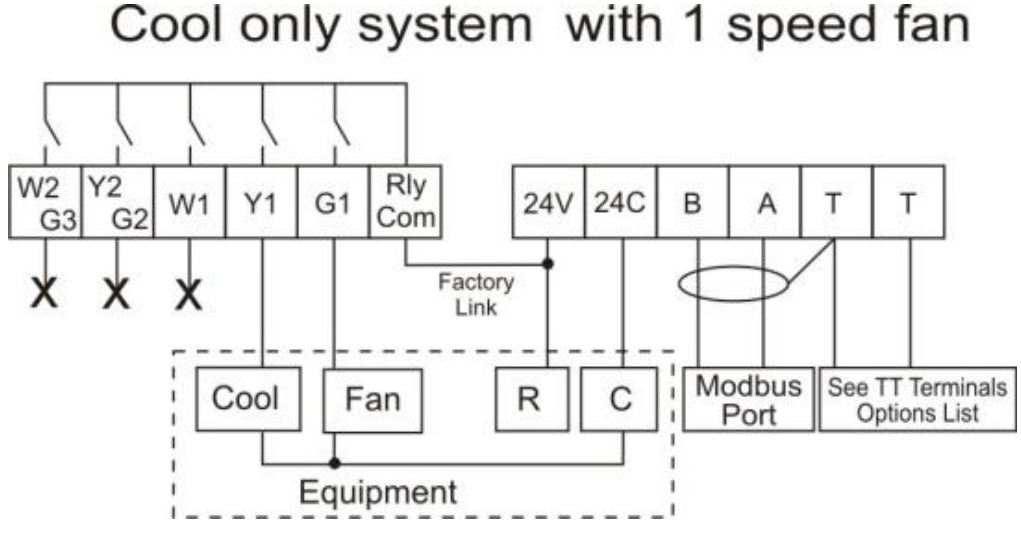


Figure 5

Switch Settings
Sw1 = Off (1 speed fan)
Sw2 =Off (HC System)
Sw3=Off (Single Stage)
Sw4= N/A
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements
Tip
Set Installer menu Fn=C

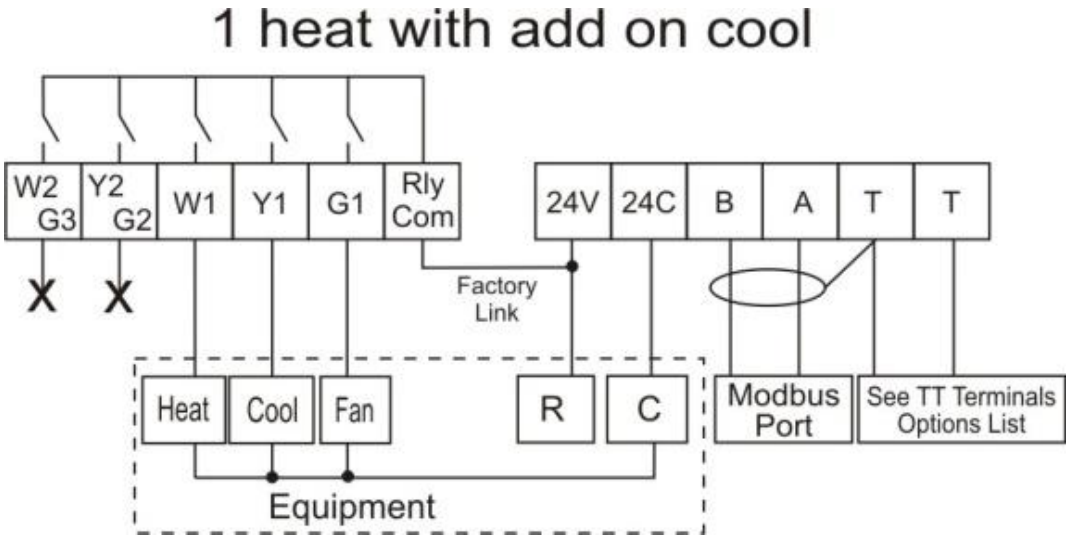


Figure 6

Switch Settings

Sw1 = Off (1 speed fan)
Sw2 =Off (HC System)
Sw3=Off (Single Stage)
Sw4= Off (HG)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements

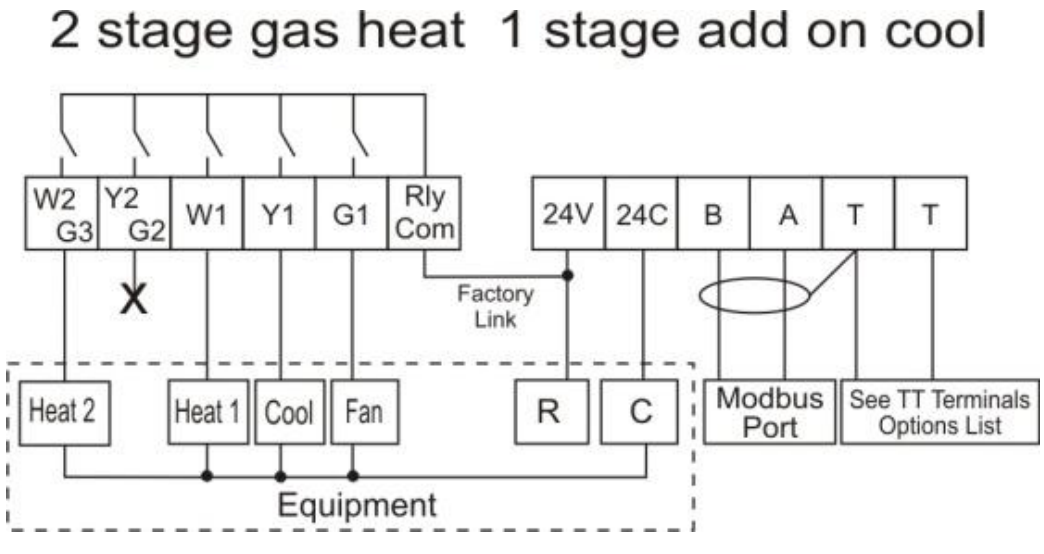


Figure 7

Switch Settings

Sw1 = Off (1 speed fan)
Sw2 =Off (HC System)
Sw3=On (Two Stage)
Sw4= Off (HG)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements

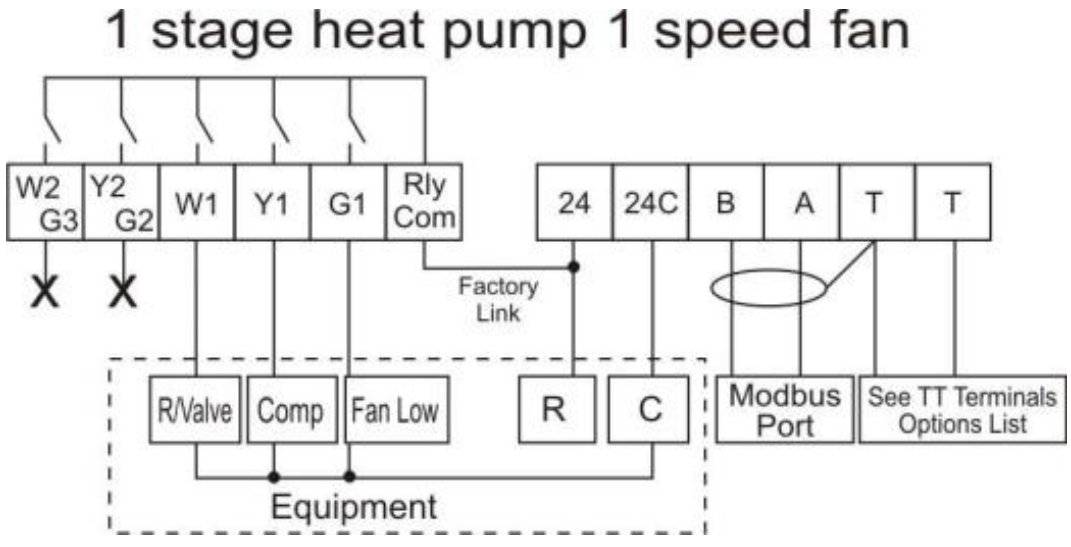


Figure 8

Switch Settings
Sw1 = Off (1 speed fan)
Sw2 =On (HP System)
Sw3=Off (One Stage)
Sw4= On Heat (B)/ Off Cool (O)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements
Note – Set SW4 to suit the system.

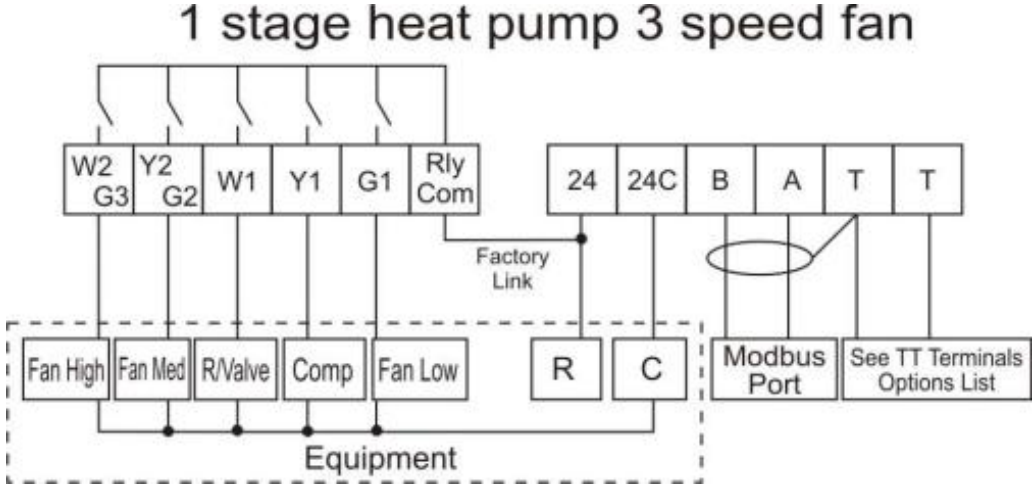


Figure 9

Switch Settings
Sw1 = Off (1 speed fan)
Sw2 =On (HP System)
Sw3=Off (One Stage)
Sw4= On Heat (B)/ Off Cool (O)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements
Note – Set SW4 to suit
suit the system

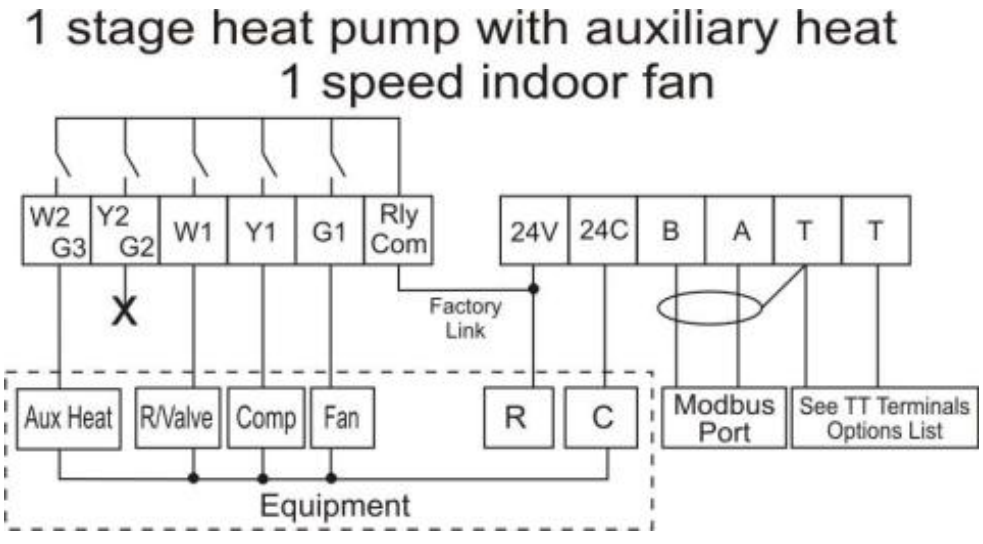


Figure 10

Switch Settings
Sw1 = Off (1 speed fan)
Sw2 =On (HP System)
Sw3=Off (One Stage)
Sw4= On Heat (B)/ Off Cool (O)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements
Note – Set SW4 to suit the system.

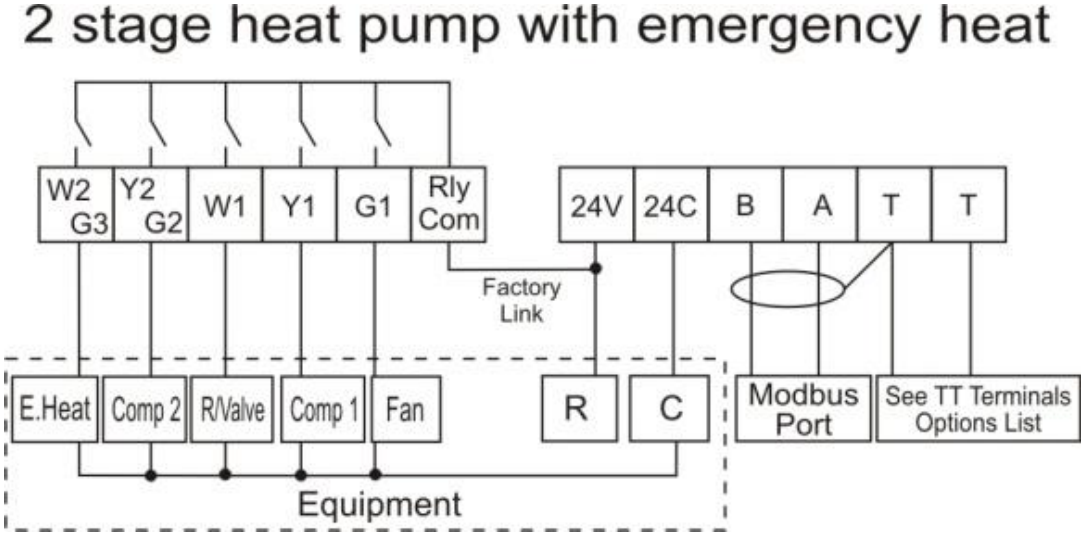


Figure 11

Switch Settings
Sw1 = Off (1 speed fan)
Sw2 =On (HP System)
Sw3=On (Two Stage)
Sw4= On Heat (B)/ Off Cool (O)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements

Note: Set W3=EH in the installer menu.

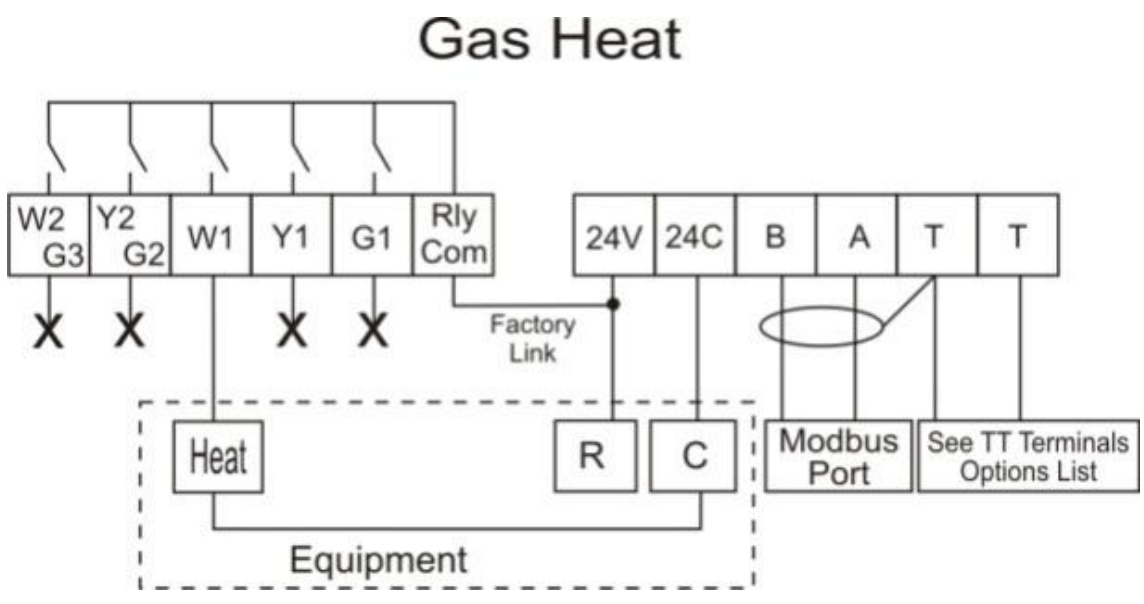


Figure 12

Switch Settings

Sw1 = Off (1 speed fan)
Sw2 =Off (HC System)
Sw3=Off (Single Stage)
Sw4= Off (HG)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements

Tip

Set Installer menu Fn=H

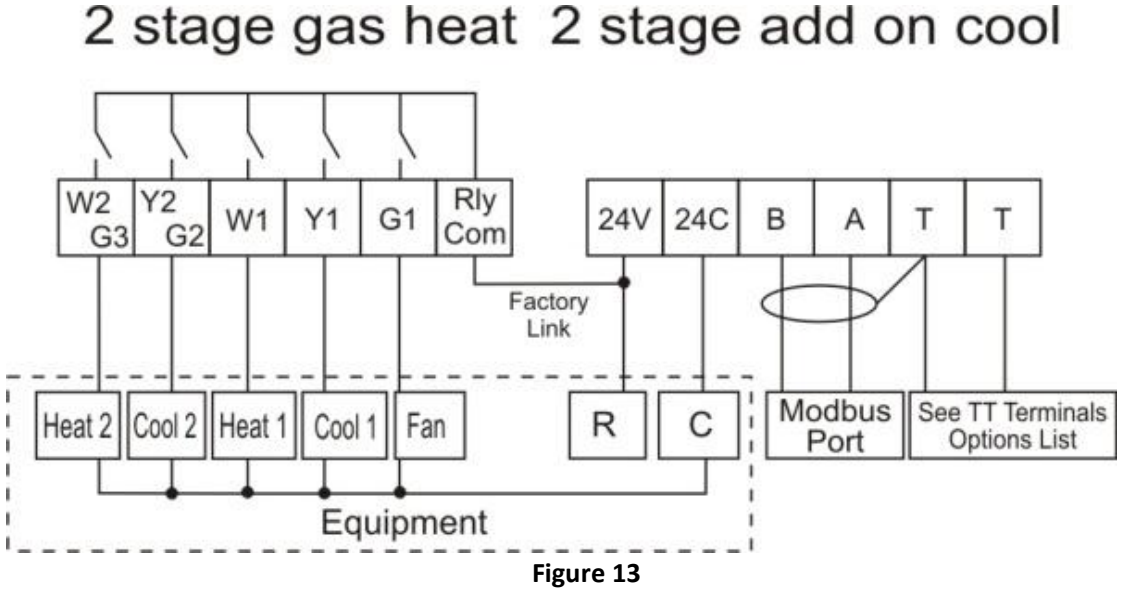


Figure 13

Switch Settings

Sw1 = Off (1 speed fan)
Sw2 =Off (HC System)
Sw3=On (Two Stage)
Sw4= Off (HG)
Sw5= Installer preference
Sw6= User requirements
Sw7= Installer preference
Sw8= User requirements

Attaching the thermostat

Check that the position of the 8 DIP switches matches the requirements of the equipment being controlled and the specific requirements of the user. Detailed information on the 8 DIP switches can be found on page 6 of this manual.

Check the wiring matches that of the equipment the SMT-770 is to control and that all wiring is tight and not likely to short between adjacent wires. Equipment wiring information can be found on page 12 of this manual.

If using the ModBus communication capability of the SMT-770, ensure the “A”, “B” & “T” data wires are in the correct position as an error here may affect the communication of the entire network. See page 38 for detailed wiring of the communications port of the SMT-770.

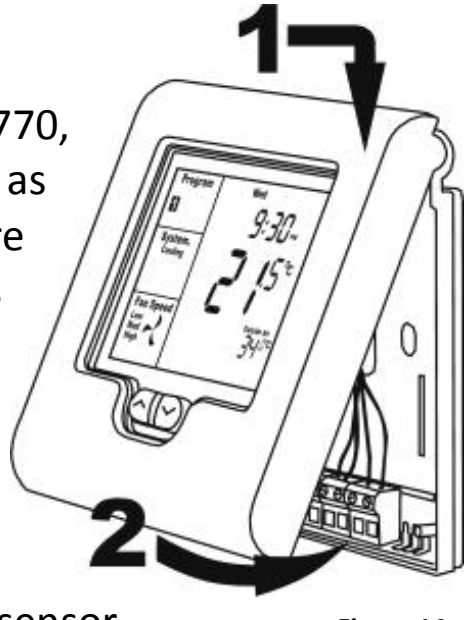


Figure 14

Using masking tape or similar, block the hole in the wall where the wiring enters the back of the thermostat to prevent drafts that may travel down the inside of the wall cavity affecting the accuracy of the internally fitted temperature sensor.

Remove and discard the plastic tab on the internally fitted backup battery so that the battery is now in circuit and operating. Take care not to damage the battery holder when doing this.

When attaching the thermostat to the base, avoid twisting the case as this may stress the LCD and cause it to crack. Avoid running wiring near the internally fitted sensor.

Take care not to damage or crush the temperature sensor between the two half's of the case when you close the Chameleon case. Check this sensor location.

Advanced Installer Settings

The SMT-770 is fitted with many advanced functions that can be finetuned by the installer to specifically match the needs of the project of the user.

Normally these functions will not need to be altered from the factory default position however, there may be times when you wish to alter a setting or control capability so that the SMT-770 performance will perfectly match a particular application. On the next few pages there is detailed explanation of these functions and their range of control.

While in the advanced installer menu, all SMT-770 equipment control functions will be suspended. Normal equipment operation will continue when you have exited this menu (after any anti cycle delays or safety delays have terminated).

Entering the Installer Menu

To enter the Installer menu, press and hold the O/RIDE button for 15 seconds. After 15 seconds the LCD will show "88:15" (eight eight one five).

Adjust this value to "88:21" – (eight eight two one) the factory default PIN (or your previously selected value) by using the up (▲) or down (▼) button. Tap the O/RIDE button to enter the menu.

If you have entered the correct PIN you will be given the first menu option, if you have entered an incorrect PIN you will be exited from this menu.

Using the Installer Menu

To move forward through the Installer menu items tap the "O/RIDE" button.
To move backwards through the Installer menu items tap the "PROG" button.
To adjust a value in the Installer menu tap the (▲) or down (▼) buttons.
To exit the installer menu tap the "Mode" button, the "Fan" button or wait 60 seconds.

Default Installer Values are shown in the examples below.

PN = 21 Keyboard Lock PIN

This is the required PIN for future entry into the Installer menu.

Range 00 to 99 in 01 steps. To prevent accidental PIN changes, you must press and hold the ▲ or ▼ buttons for longer than 1 second to change the PIN value.

(Caution, if you change this value and forget your new PIN, you may need to return the* SMT-770 *to place of purchase for unlocking, there may be a fee for this service)

LC = 0 Keyboard Lock level

Programmable Mode (SW6=ON)

LC = 00 - Key board Lock OFF.

LC = 01 - All buttons are locked except the Temperature +/- buttons*.

LC = 02 - All buttons are locked except the O/Ride button & Temp +/- buttons*.

LC = 03 - Fan and Program buttons are locked*.

LC = 04 - Fan, Program and Override buttons are locked *.

LC = 05 - All buttons locked except O/Ride.

LC = 06 - All Buttons locked.

Manual Mode (SW6=Off)

LC = 00 - Key board Lock OFF.

LC = 01 - All buttons are locked except the Mode button.

LC = 02 - All buttons are locked except the Mode and temperature +/- button*.

LC = 03 - Fan & O/ride buttons are locked*.
Mode button can only select Auto (Heat & Cool) and off.

LC = 04 - O/Ride Button is locked*.
Mode button can only select Auto (Heat & Cool) and off.

*(*Note the temp +/- buttons range can be limited in the HL & CL menu)*

HL = 49 (120F) Heating Limit (or High Limit) The highest heating value permitted to be set by the user. Adjustable between 0~35c (32~95F).
CL = 5 (41F) Cooling Limit (or Low Limit) The lowest cooling value permitted to be set by the user. Adjustable between 5 ~37c. (41~98F).
CF = C Temperature display Format Deg C or deg F display type. (effects all user and installer menu items)
C1 = 0.0 Fitted Sensor Calibration Calibration offset for the internal sensor. Adjustable range +/- 4.5 deg C (+/-9 F). in 0.1 steps
tC = 12 Time Clock tC = 12 - 12 Hour Time Clock. tC = 24 - 24 Hour Time Clock. tC = 0 - No time clock shown (Manual mode only –SW6=off)
td = 0 Temperature Display **TD = 00** - The SMT-770 will display both the room & set temperature. **TD = 01** - The SMT-770 will display set temperature only.
AH = 2 After Hours Override Timer **Start / Stop Mode** - Commercial Thermostat Mode (Sw6=on, Sw8=off) After hour run time period - Adjustable range 0 (off) to 12 hours in 0.5 hour steps. **Setback (1, 2, 3, 4) mode** – Residential programmable mode (Sw6=on, Sw8=on) Temporarily program override period. Off= Override till next program change or 1-12 hours (fixed time override)

St = Off Start Program temperature (Commercial Mode) Start/stop mode Only. (Sw6=on, Sw8=off). This sets the default temperature that will be used each time the “Start” program begins regardless of any adjustments the user may have made previously. Adjustable between OFF, 15~35c. (59~95F). If set to off, the user set point will not be automatically reset to a default value each day.
SC = OFf Stop Cooling temperature (Commercial Mode) Start/stop mode Only. (Sw6=on, Sw8=off). Cooling temperature that will be maintained when running the “STOP” program. (Night Setback) Adjustable between 5 ~37c. (41~98F) + OFF.
SH = OFf Stop Heating temperature (Commercial Mode) Start/stop mode Only. (Sw6=on, Sw8=off). Heating temperature that will be maintained when running the “STOP” program. (Night Setback) Adjustable between 5 ~35c. (41~95F) + OFF.
db = 0.5/1 Single Set Point Dead band *(See page 33 for more information)* Dead band between heat and cool set point when in single set point mode (sw8 off). Adjustable between 0 and 5 deg in 0.5 c steps

Fo = 0/2 Fan Options - Advanced Fan Functions

This function is only enabled when the selected fan mode is **Fan On**.
"FAN ON" will be displayed in the LCD to confirm this mode.

FO = 0 - (Default Residential mode).The fan will run continuously -, 24 hours a day 7 days a week.

FO = 1 - The fan will continue to run after the cooling stops to ensure the maximum fresh air ventilation and to aid in cooling. The fan will stop after the heating stops. (This is done to prevent cold drafts that may occur on cold days when A/C system is heating).

FO = 2 - (Default in Start Stop Mode).Available only if in Programmable Mode (Sw6=on). The Fan will Run continuously from program # 1 (or Start) Program to program #4 (or Stop) program and then run in AUTO mode overnight to maintain the night time set points.

FO = 3 - Available only if in Programmable Mode (Sw6=on). This mode is the combination of option 1 and option 2 given above.

FP = 0 Fan Purge Time Period (Fan run on)

If fan mode is Auto Fan, the indoor fan will run for FP=XX minutes after heating or cooling has stopped to extract any stored energy in the coils etc –
(Necessary for electric element heating).
Adjustable between off to 5 minutes in 1 minute intervals.

Fn = A Function - Available Equipment Modes

FN = A - Select if controlling a Heating & Cooling system.

FN = C - Select if controlling a Cooling only system. (disables heating menus)

FN = H - Select if controlling a Heating only system. (disables cooling menus)

FN=-- - (Dash) This mode will set SMT-770 to Heat only, Cool only or OFF .
(Emergency heat will also be selectable if fitted)

H3 = Of W2 relay Function

Only operates in single fan speed HP mode. (Sw1=off & Sw2=on).

H3 = Of - W2 relay is used as 2nd (or 3rd) stage Auxiliary heat.

H3 = EH - W2 relay is used to control an Emergency Heating system.

H3 = AH - W2 relay is used to control a Add On Heat system.

H3 = FF - SMT-770 set up in "Fossil Fuel" Mode (Comp stops with Aux heat)

H3 = AL - SMT will permit both Aux heat & E. Heating mode (both use W2 relay)

tt=RS TT terminal Function (see page 9 for more detail on this function)

tt = OA - Connect the outside air temperature sensor to the TT terminals to display the outside Air Temperature.

(Required for all outside air control functions to operate.)

tt = RS - Connect the remote room temperature sensor to the TT terminals to measure the temperature at a remote location away from the SMT-770.

(Note: This completely disables the temperature sensor fitted to the SMT-770)

tt = AV - The TT terminals will average the temperature measured by the SMT-770 internal sensor and remote room temperature sensor(s).

tt = OF - A closed contact on the TT terminals will switch the SMT-770 On or OFF. (More detail on this function provided on page 11 of this manual.)

tt = OC - A closed contact on the TT terminals will switch the SMT-770 to Occupied Mode, where the oC & oH temperatures will replace the user set temperatures. (See page 11 of this manual for more detail on this function.)

tt = DA - The SMT-770 will broadcast the measured temperature from the remote temperature sensor via ModBus. It will not display this value on the LCD, nor is it used for any control option.

This mode is intended to provide system feedback to the ModBus master only.

tt = 2p – The function is intended for controlling a 2 pipe fan coil. The mode of the thermostat (heating or cooling) will be determined based solely on the temperature as measured by the remote sensor. The remote sensor (RS-1D) is typically strapped to the fan coil water supply line.

The mode button only permits the user to select OFF or ON, where on is either heat or cool mode based on the remote sensor temperature.

AF = 0 Anti-Freeze Function

AF = 0 - Antifreeze function off.

AF = 1 - Room temperature will not be permitted to fall below 5c (41F).

oH = Off Occupied Mode Heat Set (see page 11 for more information).

Only operates if TT=OC.

This is the heating temperature that will be used in "Occupied mode" and will temporarily replace the user heat set point while the TT terminals are shorted together.

Adjustable range 0-35c (32 – 95f)

oC = OFf Occupied Mode Cool Set (see page 11 for more information).

Only operates if TT=OC.

This is the cooling temperature that will be used in "Occupied mode" and will temporarily replace the user cool set point while the TT terminals are shorted together.

Adjustable range 5-37c (41 – 98f)

SP = 2 Stage 1 Span *(See page 33 for an overview of this control function)*

Hysteresis for Stage 1.

(difference between heating and cooling turning on and off)

Sp = 1 0.5c

SP = 2 1.0c

Sp = 3 1.5c

Sd = 2 Stage 2 Span *(See page 33 for an overview of this control function)*
Hysteresis for Stage 2.
(difference between heating and cooling turning on and off)
Sd = 1 0.5c
Sd = 2 1.0c
Sd = 3 1.5c

S3 = 2 Stage 3 Heat Span
When set to 2 stage heat pump, this value sets the span for the 3rd stage heating.

SU = 10 Smart Upstage
When the room temperature is far enough from the set temperature to call extra heating and cooling stages, the SMT-770 will wait the minimum Su= value before bringing on extra stages. This delay provides time for the thermostat to determine whether additional stages are needed or if the current stages will bring the room to set point in a “reasonable” period of time.

dt= 30 Upstage delay time
Time in minutes before next stage of heating or cooling is to be called.
Delay only operates if stage trip temperature has not yet been reached.
Adjustable between 10 ~ 90 Minutes in 5 minute steps.

oS = 0 Optimised Start/stop. (Adaptive Recovery)
OS = 0 - Optimised start/stop function Off.
OS = 1 - Optimised start/stop function running.
(See page 42 for more information on this function)

C2 = 0.0 Calibration Remote Sensor

Calibration Offset for the TT terminal temperature sensor. Adjustable range +/- 4.5 deg C (+/-9 F).
Co = 5 (41F) Cooling OFF temperature. - See page 41 for more detail. Only operates if tt=OA and outside temperature sensor is fitted. Outside air temperature below this value will force the cooling function OFF. Adjustable between 0 ~37c. (32~98F).

Ho = 35 (95F) Heating OFF temperature. - See page 41 for more detail. Only operates if tt=OA and outside temperature sensor is fitted. Outside air temperature above this value will force the heating function OFF. Adjustable between 0 ~37c. (32~98F).
HB = 37 (98F) High Balance Point. - See page 40 for more information. tt=OA, the outside temperature sensor must be fitted and Sw 1=off. 2nd (or 3rd) stage heating is locked out when the outside air is above this temperature. Adjustable between 0 ~37c. (32~98F).
LB=-9.5 (15f) Low Balance point. - See page 40 for more information. tt = OA, the outside temperature sensor fitted, H3=EH, Sw 1=off and Sw2=on. Outside temperatures below this value will automatically select Emergency Heat mode. Adjustable between -9.5 ~25c. (15~77F).
Ft = off Filter warning time Return air filter cleaning warning time. Adjustable between off and 900 hours.
Ad = 07 ModBus Address. See page 38 for more information. ModBus communications address
Bd = 9.6 ModBus Baud Rate Bd = 4.8 - ModBus baud rate is 4,800 Baud. Bd = 9.6 - ModBus baud rate is 9,600 Baud. Bd = 19.2 - ModBus baud rate is 19,200 Baud.

Cd = 01 Commissioning Mode. See page 38 for more information.

Cd = 0 - Commissioning mode is OFF.

Cd = 1 - All time delays are off or reduced to a very small value.

SS = 0 Start Stop Mode Override *(Typically used by ModBus Master)*

SS = 0 - User Start Stop program in use

SS = 1 - Thermostat held in "Start" program typically via call from ModBus master.

SS = 2 - Thermostat held in "Stop" program typically via call from ModBus master.

OF Override Function *(Typically used by ModBus Master)*

OF=0 – The SMT-770 will control its own relays (Default)

OF=1 – The 5 SMT-770 relays are being controlled via a ModBus master only.

No buttons will function and all programming and control information is suppressed. The word "Override" will flash on the LCD during this mode. The SMT-770 will automatically exit this mode if no valid ModBus signals have been received for 5 mins.

RS = 40 Thermostat sensor response time to room temperature changes.

Adjustable from RS=10 (very fast) to RS=90 (very slow) Default is RS=40

tS = 0 Factory test mode - See page 40 for more information.

TS = 0 - Factory test Mode OFF.

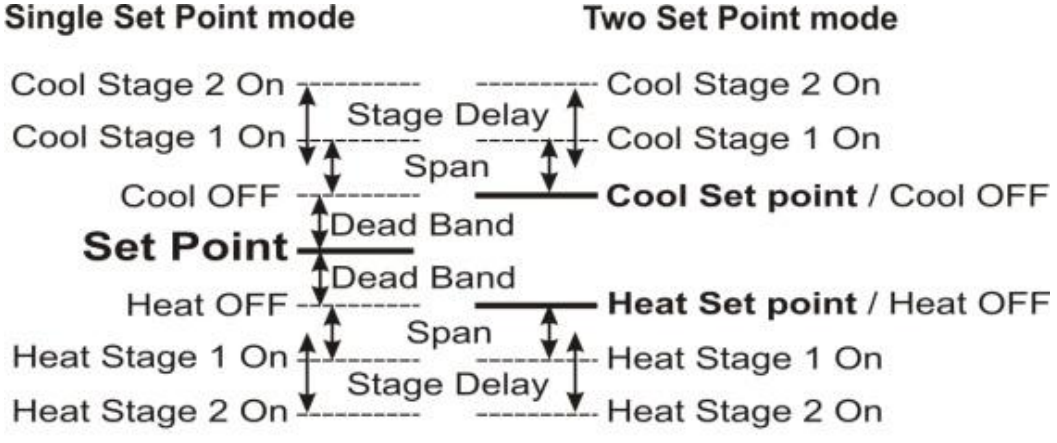
TS = 1 - Display configuration code.*

TS = 2 - Step cycle all relays in sequence, 1 2 3 4 5 etc.

TS = 3 - Reset software to factory default. **Press Fan button to initiate**.

(this table is available from the download section at www.thermostat.com.au)*

Control logic



This simple diagram (right) provides a general insight into the control logic of the SMT-770 thermostat. It attempts to describe the action of the DB=XX, the SP=XX and SD=XX advanced installer control capabilities in both two set point and single set point mode. By adjusting these three values to suit the needs of the user or equipment extremely tight temperature control can be achieved, or a more energy efficient temperature control profile can be set.

In single set point mode (sw8=off) the individual heating and cooling set points are replaced by a “Dead Band” where the heating and cooling differential is controlled by a installer set value. This is the simplest method of temperature control.

Further, you are able to adjust how quickly the SMT-770 “Chameleon” thermostat responds to room temperature changes by adjusting the RS=XX value in the installer menu. The lower this setting the faster the thermostat will respond to room temperature fluctuations, the larger this number the slower the thermostat will respond to changes in room temperature.

Commissioning

As with any thermostat, commissioning ensures that the thermostat and the equipment connected to it are operating correctly and as expected. Although the SMT-770 is a multifunctional thermostat, commissioning is quite a simple process. Follow the steps detailed below and use the troubleshooting guide on page 44 if you encounter a problem.

When the thermostat is fitted to the base plate and when 24VAC power is first applied, the LCD should briefly show all available segments (a LCD function test) then display the software version number before showing the time and operating mode etc.

The SMT-770 is fitted with a number of safety and energy saving time delays. If desired, these can be disabled for commissioning purposes by entering the installer mode and setting the CD=00 value to read CD=01. After exiting the installer menu you will note a “Spanner” icon flashing on the LCD to remind you that commissioning mode is Active. <u>After commissioning has been completed it is important to disable commissioning mode by entering the installer menu once again and setting the CD=01 value back to CD=00.</u>

Note- when in commissioning mode **<u>ALL</u>** time delays are either OFF or reduced to a extremely low value, it is therefore normal to potentially call for 3rd stage heating almost instantly 0.5deg below the heating set point.

If you choose not to use commissioning mode you may see various words and Icons flashing in the LCD whenever a time period is in use. For example, the word “HEAT” may flash to indicate heating is required but being held off by the 4 minute anti-cycle timer. Or the word “HEATING” may be flashing to indicate set point has been achieved however heating is being held ON by the minimum run timer.

The golden rule with the* SMT-770 *is anything that flashes is a timer overriding what would normally be expected to occur; either a function is being held on or off momentarily. Please be patient.

Test fan operation.

With the thermostat OFF (tap the mode button to show OFF in the LCD). Simply tap the fan button to cycle through the available fan speeds. As the LCD changes to show the fan speed or fan mode you should here faint “clicks” as the SMT-770 internal relays change, the equipment fan speed should change accordingly.

Test heating and cooling (if both fitted).

Turn the SMT-770 to Auto season change mode by tapping the mode button until the words “Heat” and “Cool” are shown on the LCD.

Using the temp ▲ or Temp ▼ button set the desired temperature a few degrees below the ambient temperature. After a few moments you will hear a click and the word “Heat” will change to “Heating”. Verify that the heating system is on and operating

correctly. If stage 2 heat is being called the full stop "." on the end of the word "MODE" will be seen to indicate 2nd stage heat. Stage 3 of heat is indicated by the full stop flashing.

Using the temp + or Temp – button set the desired temperature a few degrees above the ambient temperature. After a few moments you will hear a click and the word "Cool" will change to "Cooling". Verify that the cooling system is on and operating correctly. When stage 2 cool is being called, the full stop "." on the end of word "MODE" mode will be seen to indicate 2nd stage cool.

Tap the mode button turn the SMT-770 OFF. After any necessary timers have expired all heating, cooling and fan functions should stop. Verify that the system has shut down.

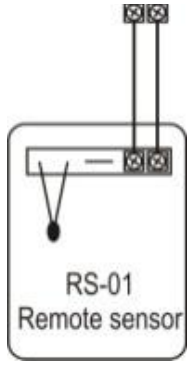
Note, in HP mode (SW2=ON) it is normal for the reversing valve to remain energised after the compressor has stopped. This is done to prevent "de-compression HISS" and to limit the wear on the reversing valve. 30 minutes after the last reversing valve use it will de-energise to conserve power.

If commissioning mode has been used it is important that the function be turned OFF before handover to the user.

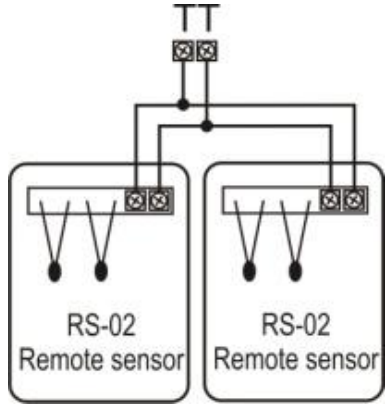
Using the User Manual as a guide set the real time clock and the preferred user programme (if applicable). Explain equipment & thermostat operation to the user. Commissioning is complete.

Using Remote Temperature Sensors

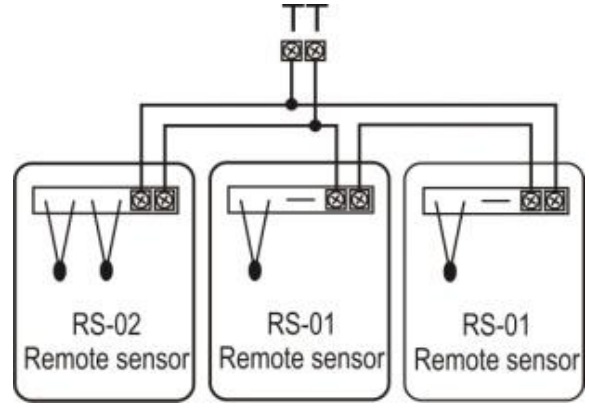
Figure 15



Single Sensor

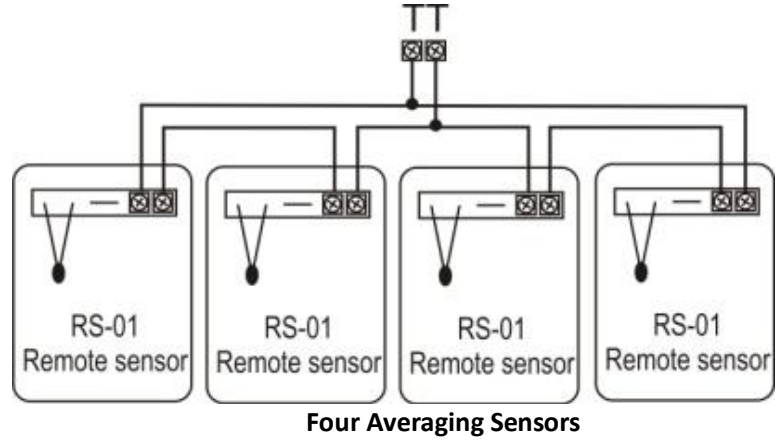


Twin Averaging Sensors



Three Averaging Sensors

Single or multiple room air temperature sensors can be connected to the SMT-770 "TT" terminals if temperature averaging over a larger area is desired. 4 examples of commonly used sensor configurations are shown. Note - Either TT=RS (remote sensor) or TT=Av (Averaging sensors) value must be set in the advanced installer menu for these sensors to be used.



Four Averaging Sensors

Please note the configuration of RS-01 & RS-02 sensors in the examples provided above. Other sensor configurations are also available.

A typical maximum of 40 meters is permitted for sensor runs with unshielded cable. If longer distances are required a larger diameter (0.3mm) shielded cable should be used.

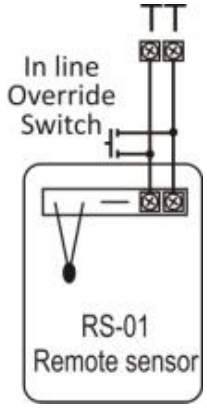


Figure 16

When used in Start / Stop commercial programmable mode (SW6=on SW8=off), the afterhours run timer can be toggled on or off as required with a momentary press button on the remote sensor. See figure 17.

As the SMT-770 "Auto detects" sensors connected to the "TT" terminals, temperature sensors can also be switched on and off as required by placing a switch in the sensor wiring to open circuit the sensor loop. See figure 16.

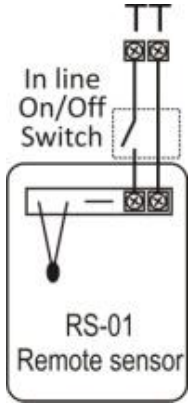


Figure 17

Advanced Functions

ModBus Communications

The SMT-770 has integrated ModBus communications capabilities where, using a remote PC or building Direct Digital Control (DDC) system may view or adjust many of the SMT-770 functions remotely.

It is not the scope of this manual to provide detail on the communication capability of the SMT-770. Detailed ModBus communications detail is available for download from the download page at www.thermostat.com.au

The communications port of the SMT-770 has 3 terminals used for communication. “A”, “B” & “T”. Terminals “A+” & “B-” are used for data communication, the terminal “T” (a shared terminal from the thermostat T T input) is used as a Vss (screen ground to protect the integrity of the communication signal).

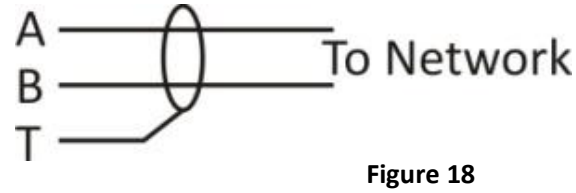


Figure 18

A maximum of 32 SMT-770s can be connected to any single hub.
Each SMT-770 on the hub must have a unique network address (factory default is 7). These settings are adjustable from the advanced installer menu. See page 19 for more detail on setting the communications address.

A typical ModBus wiring example is given below. If using a common power supply to power all thermostats on a network, it is highly recommended that all thermostats power is wired in phase, i.e. “R” to “R” and “C” to “C” and NOT crossed.

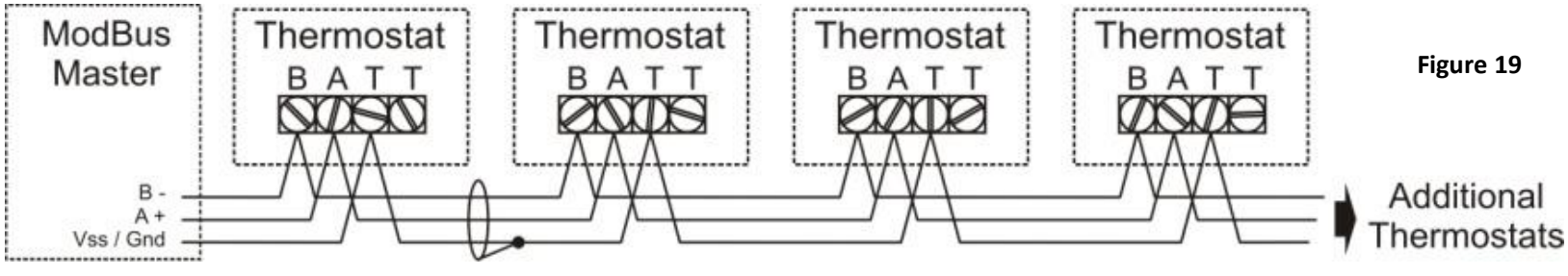


Figure 19

In many cases where multiple thermostats are used in a single network or on a long network run the two DIP switched located between the “R” & “R/Com” terminals on the thermostat PCB should be switched on to improve network reliability.

It is essential that the network be wired as a daisy chain as shown in fig 20.

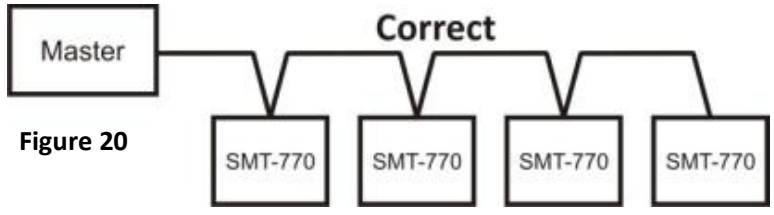


Figure 20

Fig 21 & 22 show examples of how NOT to wire a ModBus network.

Short communication runs, 1mm (18 gauge) twisted pair unshielded wire can be used, however for longer runs or where electrical noise may be present twisted pair with shield should be used.

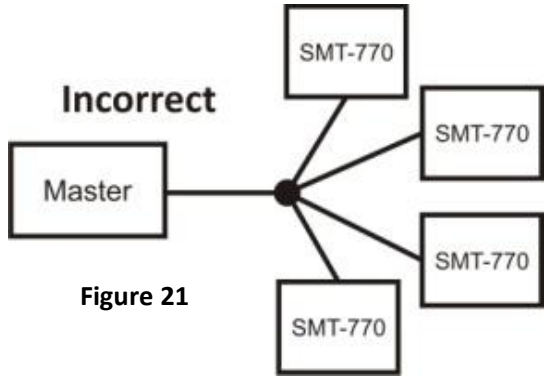


Figure 21

Factory Test Mode

The SMT-770 is fitted with a simple factory Test Mode where you can confirm that all relays outputs functions and the current configuration of the thermostat.

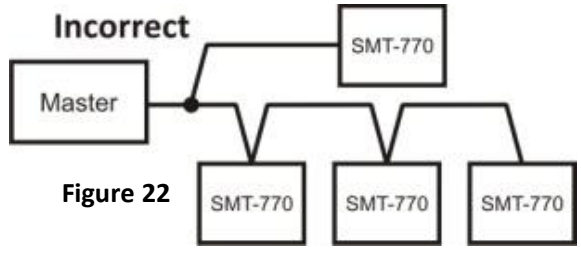


Figure 22

Ts = 0 Factory Test Function is OFF.
Ts = 1 Display DIP switch configuration code.
Ts = 2 Relay test mode. All relays cycle on then off in an endless loop.
Ts = 3 Factory Software reset – Press Fan button to confirm.

High and Low balance points

The SMT-770 is fitted with both High and Low Balance Point control capability.
For these functions to operate the Installer setting must be TT=OA (outside air temperature sensor fitted), the outside air sensor must be installed and SW1 must be OFF (Single fan speed mode).

High Balance point.

Set the installer menu value “HB=XX”.
When the outside air temperature is above this value, second or third stages of heating are held off regardless of the room and set temperature.
Set this function is designed to prevent the excessive consumption of energy for heating when the outside air temperature is warm.

Low Balance point

SW2=on, H3 =EH (Emergency Heat Mode) Set the installer menu value “LB=XX”.
When the outside air temperature is below this value the SMT-770 will automatically switch to emergency heat mode when heating is required. If the outside temperature is above this LB=XX value the emergency heat mode can be selected manually at anytime with the “MODE” button.

Setting up the Heat & Cool Off functions

To conserve energy, the SMT-770 can suspend the heating or cooling functions if the outside air temperature is within a prescribed installer set range.

If the outside air temperature is above the HO=XX (heating OFF) value, heating will not be called regardless of the room and set temperature. If the outside air temperature is below the CO=XX value, cooling will not be called regardless of the room and set temperature. “Heat” or “Cool” and the word “Locked” will flash on the LCD to show that these modes have been restricted.

Adaptive recovery

Only available in programmable mode (sw6=on).

The adaptive recovery function of the SMT-770 permits the user to program a time that a desired set temperature is required, letting the thermostat calculate the most energy efficient time to turn on to achieve the desired temperature at the selected time.

If the user typically returns home at 5:00pm at the end of the work day, setting program #3 (if used in residential programmable mode) to 5:00pm the SMT-770 will calculate the most energy efficient time based on the set and room temperatures as well as a history of temperature change to bring on the equipment prior to 5:00pm to meet the desired set temperature by 5:00pm. For example, when heating is required the heating may start at 4.32pm so that the set temperature is reached at 5:00pm

Adaptive recovery may also prevent the SMT-770 from running for a few moments just prior to a program change occurs.

“RECO” is shown in the LCD when ever Adaptive recovery is being used.

Specifications

Input Voltage	24VAC 50/60 Hz +/- 15%.
Relay rating	24VAC @ 1Amp maximum per relay.
Operating Temperature	0-50C (32 to 122F).
Operating RH	0-95% (non condensing).
Storage Temperature	0-65C (32 to 150F).
Size	113 x 103 x 23mm.
Display Size	74 x 55mm.
Temperature Sensor(s)	10K NTC type 3.
Accuracy	+/- 0.3deg C @ 25 C. (77F)
Stage Delays	Minimum temperature change over time method.
Timed upstage Delay	5~90 minutes.
Anti-cycle Delay	Off to 4 minutes.
Maximum hourly cycles	Unlimited, 30, 10 or 6. (Installer set)
Display resolution	0.5 deg C (1F).
Control Range	Off to 38c (100F).
Outside Air temp display range	-8 ~ +60c (17 ~ 140F).
Back light	Blue EL.
Backlight life	3,000 hours to half brightness.
Adaptive recovery method	Time to start vs temp differential method - updating.
Communications Protocol	ModBus – contact Smart Temp for objects list.
Fan speeds	Based on difference between room and set temp.
Approvals	FCC (Part 15) (pending), C-tick.
Warranty	3 years RTB.

Sensor Reference Table

KΩ	24.3	22.0	20.0	18.1	16.2	14.3	13.7	12.5	11.4	10.4	10.0	9.57	8.75	8.05
C	6	8	10	12	14	16	18	20	22	24	25	26	28	30
F	42.8	46.4	50	53.6	57.2	60.8	64.4	68	71.6	75.2	77	78.8	82.4	86

Troubleshooting

Symptom	Suspected Fault	Suggested remedy
Temperature display seems inaccurate	Air from the wall cavity may be leaking into the rear of the thermostat / sensor enclosure.	Plug holes in wall with tape to prevent leaks
	The internally fitted temperature sensor is folded back inside the Chameleon and not being exposed to the room air temperature.	Carefully move the room temperature sensor bead so that it is just behind the sensor opening in the case.
	External heat or cool source such as lamps, televisions or drafts from open doors affecting the accuracy of sensor.	Move lamps, vents or other sources of abnormal temperature away from sensors
	Sensor calibration may setting are incorrect	Adjust C1=XX value in installer mode to correct perceived sensor inaccuracy. Page19
"Locked" appears on LCD and heating or cooling will not operate.	This is not a fault. Outside air temp to high to require heating Outside air temp to low to require cooling.	The Ho=XX &/or Co=XX value is inhibiting heating or cooling calls. Change these values in the installer menu, details on page 19.
Heating or cooling runs in dead band.	SMT-770 incorrectly set to HP mode. (SMT-770 keeps reversing valve energised after heating / cooling has stopped to limit decompression noise from AC system.)	Set SW2=OFF and retest heating & cooling operation.
	Minimum run period has not yet expired. Words "Heating" or "Cooling flash in the LCD	Sw7 sets minimum run period from 2 or 6 minutes.
	Compressor and reversing valve wiring crossed in HP mode (sw2=on)	Check W1 & Y1, Y2 for correct connections.
SMT-770 has no display	Power failure or faulty SMT-770	Check for 24VAC on the 24 & 24C terminals
Reversing valve remains energised after heating or cooling has stopped.	This is not a fault	The reversing valve remains energised after the heating/cooling has stopped to limit de-compression hiss. Reversing valve will de-energise within 2 hours of the last call.
Spanner Symbol flashes on LCD	This is not a fault Commissioning mode enabled.	Exit commissioning mode before handover to user. See page 21
E.Heat or E.Heating is shown on LCD without manually selecting it.	This is not a fault.	LBP reached, outside air too cold for reliable HP operation. Set LBP with the LB=XX value in the installer menu, details on page 19

Symptom	Suspected Fault	Suggested remedy
The word OFF is flashing in the LCD. Mode button has no effect.	This is not a fault	TT=Of in advanced installer menu.
Some buttons do not appear to operate. Padlock is show on LCD.	Key board lock is on.	LC=XX value in advanced installer mode set the lock values, see page 19.
Cannot enter heat or cool modes	SMT-770 thermostat set for Heating or cooling only modes	Heating or cooling mode not available on your air conditioning system
Cannot set heating and cooling to desired value. Padlock symbol flashes	This is not a fault.	HL=XX (heating set point limit) and CL=XX (cooling set point limit) restrict control range. See page 19 for more detail.
Outside Air Temp display is showing dashes	Outside air temperature air sensor has failed.	Check wiring and outside air sensor. Replace outside air sensor
	No outside air sensor fitted.	Change TT=AO to TT=RS in advanced installer menu.
"Heat" or "Cool" is flashing in the LCD. Heating or cooling has not started.	This is not a fault. Heating or cooling will start shortly.	Anti cycle delay in progress. This can be disabled if required for commissioning. See page 21.
The Fan runs on for some time after the heating or cooling stops, even when I turn the SMT-770 OFF.	This is not a fault.	The fan purge mode is set. FP=XX value
SMT-770 displays wrong mode (C or F).	The SMT-770 can operate in both Deg C and Deg F mode as set in installer menu.	See page 19 for changing the CF=XX value
Cannot select multiple fan speeds	SMT-700 set for single fan speed Sw=OFF	Turn SW1 to ON. NOTE, 3 fan speed mode can only be used on single stage systems.

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